

# The Northwest Technology Transfer Center BULLETIN

Number 38

Spring 1993

A Newsletter of the Local Technical Assistance Program (LTAP)

## SHRP's New Work Zone Safety Devices — The Intrusion Alarm

Maintenance workers and supervisors worry about safety continually. And it is no wonder. Sixty highway workers die on the job each year, according to the Federal Highway Administration (FHWA).

Our country's roads and bridges require an ever-increasing amount of maintenance activity and expenditure, and, at the same time, traffic levels continue to escalate. The combination is deadly.

Just how deadly was illustrated by an accident that occurred July 26, 1990, near Sutton, West Virginia. A tractor-trailer

collided with two cars stopped for a work zone. The crash killed all eight occupants of the cars. Luckily, no maintenance workers were killed. As a result of the accident, the National Transportation Safety Board (NTSB) recommended that highway agencies provide audible warning devices — such as a horn — in work zones; and encouraged the use of other safety devices, such as rumble strips, to alert oncoming drivers.

These new measures are necessary because, as motorists encounter more and

more work zones, they are becoming “numb” to the various warning signs used by highway agencies for so many years, especially when the work is close to home on the routes they drive “automatically” each day. Another problem is the exponential increase in the number of traffic jams caused by highway work, which makes motorists frustrated and angry. All this spells risk for highway workers.

To help make maintenance work safer, the Strategic Highway Research Program

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## **Plan to attend**

# **The Washington Association of County Road Supervisors' Equipment Rodeo and Joint State East/West Meeting**

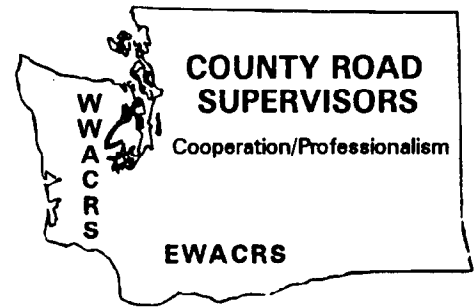
**April 27-29, 1993**

(Presentations on Deferred Compensation, Hazardous Waste, Water Quality Issues, Fair Labor Standards Act, Dealing with Substance Abuse, CRAB Update)

Wenatchee Center Hotel (509) 662-4411

Register by mail or at the door on April 28 (8:00 a.m. to 9:30 a.m.). Fee is \$75 which includes lunch and dinner on Wednesday, April 28.

**Contacts:** Ed Rich (509) 884-3937, Will Kinne (206) 591-7702



*Continued from page 1*

(SHRP) conducted a national design competition for new work zone safety devices (Project H-109). Ideas came from private industry, from transportation officials, and, perhaps most importantly, from maintenance worker themselves. Now, after more than 40 months of development and closed-track testing, many devices are ready for use.

### **Intrusion Alarm Buys Time for Workers**

Of all the new safety devices coming out of SHRP, the Infrared Intrusion Alarm was rated tops by about 35 maintenance workers surveyed in Iowa, Michigan, and Oregon. The alarm works by sounding a loud (120-decibel) siren whenever a vehicle strays into a work zone, giving maintenance workers four to seven second warning to clear the work area.

Developed by Graham-Migletz Enterprises of Independence, Missouri, the alarm has three components:

- A detector with an infrared "eye;"
- An orange safety cone with a reflective sock; and
- A receiver with a siren.

This mostly solid-state detector weighs in at only 28 pounds. A worker can set it up in seconds. Placed at the edge of the

road at the end of the work zone taper, the detector bounces its infrared beam off a reflective strip or sock on an orange safety cone placed on the opposite side of the closed lane. The detector communicates with the siren by radio so no wires are necessary. The siren is placed near

maintenance workers. When an errant vehicle enters the closed lane and breaks the beam, the siren sounds. This life-saving device costs about \$4,000.

*(Source: SHRP's "Product Alert," No. 8, July 1992.)*



*A pothole-patching operation: typical, yet hazardous.*

# In the News

## 1993 Annual WSDOT/RTPO/MPO Conference Planned

1993 Annual WSDOT/RTPO/MPO Conference will be jointly sponsored with the American Planning Association, the Planning Association of Washington and the Washington State Department of Community Development. The conference will be held at the Ridpath Hotel in Spokane on May 19-21, 1993. If your organization has transportation related topics that would appropriate at this conference, please contact Mike Partridge at WSDOT, (206) 705-7964.

(Source: *TRIP "Network," Winter 93.*)

## Annual Area IV HEEP Conference Planned

The Washington State Department of Transportation (WSDOT), in cooperation with the County Road Administration Board (CRAB), are hosts of the 1993 Area IV Conference for the Highway Engineers Exchange Program (HEEP), June 13-16, 1993, at the Quality Inn Westwater in Olympia, Washington. The theme of this year's conference is "Increasing Productivity through Engineering Automation: Are We Meeting the Challenge?"

The conference audience will include 150 to 200 participants, from federal, state, provincial, and local governments. Also in attendance will be representatives from higher education, consulting engineering firms, and vendors of computer hardware and software.

HEEP was formed in 1959, to promote the exchange of computer programs, systems, and concepts among its members in the field of civil engineering, transportation, and management. Area IV consists of 14 states and five provinces in the western United States and Canada. Both CRAB and WSDOT have become members of this organization to provide their constituents quality access to advanced technology in the fields of transportation design, management, and planning.

If you need more information about the upcoming conference, or would like information on how your organization can join and enjoy the benefits of being a HEEP member (there is no fee for membership), please contact either Daniel Dickson at CRAB (206) 753-5989 or Jim Michal at WSDOT (206) 705-7116.

(Source: *CRAB's "Road Runner," March 1993.*)

## DCD's Transportation Element Guidebook

Local governments working on comprehensive plans can receive copies of a transportation element guidebook.

Prepared by Heniger & Ray and the Washington Department of Community Development (DCD) in cooperation with the Washington State Department of Transportation, the guidebook covers the key requirements of the Growth Management Act (GMA) relating to transportation planning.

It also identifies and defines actions local governments need to take to create a transportation plan that meets the:

- ☐ goals and values of their communities,
- ☐ requirements of the GMA, and
- ☐ recommendations in newly released rules called procedural criteria.

Holly Gadbaw, Growth Program Coordinator for DCD, stressed the importance of concurrency for the transportation element under the GMA. Concurrency means transportation facilities must be available at the time of development or within six years. In addition, local governments must deal with "levels of service," which includes the quality and amount of transportation services a community wants, Gadbaw added. "Cities and counties need to make sure the transportation improvements they want are things they can afford. If funding is not available to pay for the level of service they have chosen, they need to go back and adjust the level of service or increase the funding."

Levels of service for urban and rural areas, and for roads and transit service, are included in the guidebook. Travel forecasting, choosing alternatives, and developing policies also are included as will transportation demand management strategies, funding sources, and public participation.

The guidebook will be useful to all jurisdictions preparing a transportation element for a GMA-required comprehensive plan, with a focus on the needs of small to medium cities and counties. To receive a copy of the guidebook, call DCD's Growth Management Division at (206) 753-2222 or SCAN 234-2222.

(Source: *TRIP's "Network," Winter 1993.*)

**Note:** By letter of February 18, 1993, we conducted a survey of Washington's local agencies regarding their use of our T<sup>2</sup> services. We request that those agencies that have not responded complete the forms and mail the questionnaire to the consultant listed on the form. If you have lost your questionnaire, please give us a call at (206) 753-0405 or (206) 753-0143 and we can send you another. Thanks for your help.

— George Crommes

# In the News

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## Worldwide Transportation Technology Conference Scheduled

Transportation experts from around the world will convene in Seattle at the Pacific Rim TransTech Conference next year to explore surface transportation in the 21st Century. The international conference, "A Ride Into The Future," is being coordinated by the Washington State Department of Transportation (WSDOT) and the United States Department of Transportation, Federal Highway Administration.

The conference will be held July 25-28, 1993, at the Washington State Convention and Trade Center, Seattle, Washington, and is expected to attract over 1,500 delegates from the United States, Canada, Mexico, Japan, Taiwan, Australia, and other nations.

"Our goal is to present 'high-tech' information in an atmosphere that encourages the free exchange of ideas," said James Buss, WSDOT Assistant Secretary of Operations and conference co-chair. "The issues that must be dealt with in surface transportation are key to the future development of Pacific Rim countries. This conference will address those issues."

Five key areas will be covered at the conference, including: Intelligent Vehicle Highway Systems; propulsion technology, such as alternate fuels and MagLev trains; transportation management support systems; intermodal ties; and the Strategic Highway Research Program. There will also be an exhibition and trade show featuring futuristic displays of transportation technology.

Numerous governmental and private agencies and organizations are cooperating to ensure that this is an international event. Invitations to co-sponsor the conference have been extended to Japan, Taiwan, Hong Kong, Singapore, Canada, Mexico, Australia, China, and others. Several states have already committed their support, as have organizations such as the

American Society of Civil Engineers, the American Public Works Administration, the Transportation Association of Canada, and the Transportation Research Board.

"This may well be the most important transportation meeting ever held along the Pacific Rim," said Barry Morehead, Federal Highway Administration division administrator and conference co-chair. "All aspects of surface transportation will be explored in a manner which demonstrates how topics are inter-related and how technology may provide the answers to many of the transportation problems we are currently face."

The international scope of the conference will allow participants to learn about the latest transportation technology applications regardless of where they are developed. "Our presentations will provide education concerning leading edge technologies," Buss said. "We hope that our speakers and exhibitors will choose to unveil new products and services related to all areas being covered at the conference."

Plans currently call for general sessions to be simultaneously translated into the conference's official languages: English, Spanish, Chinese, and Japanese. Translators will be available for delegates on the floor of the exhibition hall.

Further information on the conference can be received by writing William P. Carr, Conference Administrator, Washington State Department of Transportation, Transportation Building, Olympia, Washington 98504-7350, U.S.A., or by telephoning (206) 705-7802; Fax (206) 705-6823.

Individuals requiring written materials in alternative formats, language interpreters, or special physical accessibility accommodations, should contact William P. Carr by June 1, 1993.

*(Source: WSDOT News Release 92-148.)*

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## Corps of Engineers Restructuring

The Army Corps of Engineers is undergoing massive reorganization in which 2,600 jobs will be eliminated and 11 divisional offices closed.

The reorganization is the first restructuring of the agency since 1942, and may dramatically reshape Corps operations. One change which will occur will be the elimination of a round of review for proposed projects. With the closing of the mid-level offices in Chicago, Dallas, New York, Omaha, and San Francisco, projects will be reviewed only at the 39 district offices and in Washington headquarters.

A second phase of the restructuring, which will require Congressional approval, will concentrate construction specialists in certain district offices, so that not every office will be able to execute every kind of construction project conducted by the Corps. The downsizing of the agency apparently has support within the Congress, which trimmed the agency's personnel budget by some \$14 million in FY 1993.

*(Source: AASHTO "Journal," December 4, 1992.)*

## **WSDOT Receives Traffic Safety Awards**

The Washington State Department of Transportation (WSDOT) recently received two awards for excellence in traffic safety from the Traffic Safety Commission and the State Association of Traffic Safety Representatives for programs promoting safety for drivers and pedestrians.

Dave Peach, State Traffic Engineer, received an award for initiating the Corridor Safety Program, an effort that brings together a diversity of state and local agencies, from emergency services to schools, to improve safety on state highways. Two pilot corridors, on State Route 9 in Snohomish County and on State Route 290 in Spokane County, are the first to be targeted as part of the program. Four more corridors are under consideration.

A second award was given to the "WILDFEET" coalition of Yakima, which includes WSDOT and several community groups. Their unique program combines safety and recycling. WSDOT donates scraps of reflective tape left over from traffic signs, and coalition members cut them into stickers shaped like small footprints. The stickers are then distributed to schoolchildren to increase their visibility to cars. The children are taught how to stick them on jackets, bike helmets, and lunch boxes as part of their safety education classes.

(Source: WSDOT "News," March 5, 1993.)

## **New Research in the Works**

A city/county research workshop was held on December 15 to evaluate and prioritize proposals for the local agency program for the FY 93-95 biennium. Twenty-six (26) ideas were submitted and evaluated. Seven projects received the greater number of votes and fall into the relative available funding.

1. Low speed (45 mph and below) Crash Test Criteria — Phase II, \$40,000
2. The Impact of a "Zero" Floodway Rise Criteria on Bridge Design, \$70,000
3. Roadway Prism Percolation Rates Outside the Pavement, \$75,000
4. Air Quality and Safety Impacts of Four-Way Stop Signs, \$50,000
5. Mapping of Slopes Susceptible to Earthquake Induced Failure, \$60,000
6. Modeling Guidelines for Pedestrian and Bicycle Planning, \$25,000
7. Mitigation of Vehicle Induced Vibrations, \$50,000

The WSDOT Research Office, after legislative approval of the budget, will refine the selected proposals and identify the research agency and staff to carry out these projects.

## **Free Publications**

*For Washington recipients only: Contact Donna Stallings at (206) 705-7372 or SCAN 705-7372 if you want publications.*

**Roadside Improvements for Local Roads and Streets, FHWA.** This is a brief 31-page guide for helping to improve safety on local roads and streets (10 copies available).

**W-Beam Guardrail Repair and Maintenance, FHWA.** This brief guide was prepared under the RTAP by the T<sup>2</sup> Center in Iowa. It is a very basic guide for recognizing extent of guardrail damage, the process for repairs, and consideration for safety (30 copies available).

**FHWA-FL-90-006 Fish Passage Through Culverts.** This booklet was prepared by the United States Department of Agriculture — Forest Service to provide a set of guidelines for the design and rehabilitation of culverts which allow fish passage. Working as a team, hydrologists, fish biologists, and civil engineers can design, construct, and maintain an acceptable structure with fish passage capabilities. The very vivid principles and criteria can be adapted to the design of any drainage structure (100 copies available).

**FHWA-RT-90-003, Vegetation Control for Safety.** This booklet is a general guide for street and highway maintenance personnel on vegetation control, line of sight clearance, and safety considerations (30 copies available).

**FHWA-PD-92-028, Bicycle and Pedestrian Provisions Under the Intermodal Surface Transportation Efficiency Act (ISTEA).** This pamphlet describes the opportunities that ISTEA offers to enhance state and local bicycle and pedestrian programs (30 copies available).

**FHWA-RT-90-002, Maintenance of Small Traffic Signs.** This booklet is a general guide for street and highway maintenance personnel on the various aspects of maintaining small traffic signs (15 copies available).

**FHWA-SA-93-020, Barrier Delineation in Work Zones: The Well Defined Path.** This pamphlet describes delineation standards, delineation devices and techniques, and maintaining the devices (30 copies available).

**FHWA-SA-93-021, Advance Warning Arrow Panels: Positive Guidance.** This pamphlet describes design standards, how they operate, placement, cost, and maintenance of using the arrow panels (30 copies available).

# Sight Clearance Ordinances

By Ed Lagergren, P.E.

Recently, I was asked to review the intersection sight distance at several intersections in a small city and make recommendations on an intersection sight clearance ordinance. After my review I did some research on the subject and will discuss my findings in this article.

Intersection sight distance is a critical factor in the safe operation of an intersection. The necessary intersection sight distance is related to the speed of vehicles on the roadways and the type of traffic control devices at the intersection. The higher the speeds the greater is the required sight distance. For stop controlled intersections a vehicle on the minor street must have enough sight distance to cross or enter the traffic stream. Many agencies develop and adopt a sight clearance ordinance to promote traffic safety at intersections.

The intersections we reviewed were on low volume residential streets with a 25 mph speed limit. The American Association of State Highway and Transportation Officials (AASHTO), in their book *A Policy on Geometric Design of Highways and Streets* 1990 in regarding local urban streets on page 433, states,

"Some streets primarily are land service streets in residential areas. In such cases the overriding consideration is to foster a safe and pleasant environment. The convenience of the motorist is a secondary consideration."

On page 434 in the **Sight Distance** section they state,

"Minimum stopping sight distance for local streets should range from 125 to 200 feet depending on the design speed."

The Institute of Transportation Engineers (ITE), *Traffic Engineering Handbook*, Fourth Edition has a section on sight obstruction regulations on page 353. This section states,

"Clear sight distance areas should be established, where possible, to ensure that obstructions do not infringe upon the lines of sight needed among motorists, pedestrians, bicyclists, and others when approaching potential conflict points (intersections). These areas usually take the form of triangles, with the sides along the intersection pathways being approximately equal to the stopping sight distance for vehicles traveling at design speeds."

They go on to say,

"The resultant stopping distance for 25-mph design speeds is on the order of 100 to 120 feet."

The shorter stopping sight distance in the ITE Handbook is the result of a one second minimum perception-reaction time assumed of a reasonably alert driver.

The intersection sight distance requirements at stop controlled intersections for local residential streets is based on stopping sight distance of vehicles on the uncontrolled street. Using these sight distance requirements and the fact that a driver's eye is approximately 15 feet back from the edge of the shoulder or curb

of the main street when stopped at a stop sign, we can construct the desirable sight triangles. For a stop controlled residential street a triangle constructed using the dimensions of 15 feet from the edge of the main road shoulder and 75 feet along the shoulder of the main road from the edge of the side street, will provide adequate sight distance. Your sight clearance ordinance can be based on these dimensions.

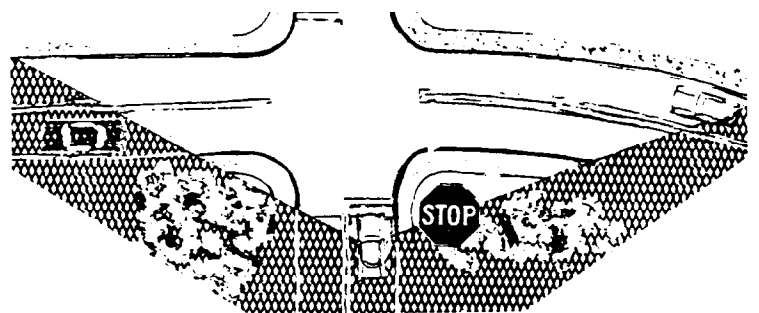
The sight triangle should be maintained in both directions for every stop sign in your residential areas. In situations where the roads do not intersect at 90 degrees, you will have to adjust the triangles to obtain a minimum of 120 feet of sight distance. If you have a 60-foot right of way, this will require little, if any, vegetation control on private property.

Arterial street sight distance is based on a vehicle on the side street being able to cross or enter the traffic stream with no or minimal impact to the vehicles on the arterial. For this reason, on arterial streets the AASHTO sight distance should be used. Traffic volumes and speeds are higher than local access streets with a higher percentage of trucks. (The AASHTO sight distance requirements were reduced in the 1990 Edition of *A Policy on Geometric Design of Highways and Streets* from the values in the 1984 Edition. This reduction is based on a different assumption for the vehicle on the major road.)

The vertical dimension should be the same in both situations. The triangle should be clear of obstacles between 3 and 8 feet above the existing street surfaces. Some obstacles, however, cannot be removed such as signposts, utility poles, and mailboxes. A little bigger "window" would be a lot better if you have these types of obstacles.

I hope I have been able to help you understand the importance of and the reasoning behind sight clearance ordinances.

If you have any questions or need advice on a traffic problem, please give me a call at (206) 753-1073 or SCAN 234-1073.



**Spring 1993**  
**Operating Tips**

# **Asphalt Pavement Recycling**

*By George Crommes, P.E. and Len Montague, P.E.*

## **Foreword**

Recycling of used pavement materials has been around since early this century. Asphalt pavement material reuse began as early as 1915, but little development and improvement of the procedure occurred until the mid-1970s. Recently different approaches have emerged and various techniques have been perfected through the benefits of research, trial and error, and new equipment. Several ways categorize pavement recycling methods, depending on:

1. *Where it is done* — in-place (at the road site itself) or at a central plant after road material is removed and hauled away.
2. *How it is done* — using hot recycling or cold recycling.
3. *The condition of the roadway* — does it require merely surface recycling or base (deep) reclamation?

This operating tip will present cold in-place recycling because it is growing in popularity and is a cost-effective way of providing significant improvement to the road surface for local governments.

**Cold-mix asphalt pavement recycling** is a process in which reclaimed asphalt pavement materials (asphalt and/or aggregates) are combined with new asphalt and/or recycling agents in-place or at a central asphalt plant to produce a "cold-mix" base mixture. An asphalt surface course is required with this process.

## **Why Consider Recycling?**

Recycling is one of many options for maintaining or rehabilitating our pavements. We should consider "recycling" because:

1. The asphalt and aggregates in our existing asphalt pavements are a valuable resource.
2. Some of our older pavements or surfaces always seem to need more than their fair share of maintenance. This is due to pavement structure deficiencies — a condition that recycling can correct.
3. Asphalt and aggregates cost more and, in some areas of the state, good aggregates are scarce.
4. Funds for roadway maintenance are limited and new funding has not kept pace with the needs.
5. Recycling has been successful in the past and present for correcting certain types of pavement deficiencies.
6. Recycling saves energy. Future energy resources are limited.

7. Existing geometrics of roadways can be preserved with recycling. Curbs, gutters, and manholes do not have to be adjusted, and no additional right of way is normally required.
8. Recycling is cost effective and efficient because of technical improvements in asphalt mixes, equipment, and reconstruction processes.
9. More traffic and heavier trucks are using pavements that were not designed for such use. Strengthening the pavement structure can be done via recycling.
10. Utilities can remain in place in most instances during recycling, thereby reducing construction costs.
11. Recycling of pavements vividly shows the concern of public agencies to conserve and save materials and costs for their clientele — the traveling public and tax payers.



## Any Limitations on Recycling?

Recycling is applicable in general for any asphaltic pavement. However, there are certain items that may be specific to the area or job that can effect the costs of recycling. As more experience is gained in recycling and as more of it occurs, many of the problems of the past will have less impact. In certain cases, the following has occurred:

1. Contractors with the expertise, experience, or equipment recycling may not be available locally.
2. Because of a shortage of contractors, competitive bidding may be inhibited, thereby reducing the potential cost savings of recycling.
3. Long-haul distances to and from central asphalt plants may make (hot-mix) recycling more expensive than using local virgin materials.
4. The amount of recycling work available may not be enough for a contractor to justify the purchase of the necessary equipment.

## When Should One Consider Recycling?

Recycling of only the surface may be considered if the pavement base and subbase are structurally good and supportive of the loads applied to them, and only surface or grade problems exist.

Partial or full depth recycling is an option for rehabilitation when pavement structure problems are expected.

Table A provides a general summary of options available to resolve various pavement problems. Highlighted are those specific problems where surface recycling or structural recycling is a possible solution.

Even though somewhat similar, the processes for cold and hot recycling have some distinct differences. One-hundred percent of the reclaimed material can be used in a hot-mix operation versus a maximum of 40 to 60 percent for cold-mix recycling.

**Table A — Solutions to Asphalt Pavement Problems**

Problem	Maintenance <sup>1</sup>				Rehabilitation <sup>2</sup>				
	Patching and Routine Maint.	Fog Seal	Surface Treatment	Slurry Seal	Surface Recycling	Thin Overlay	Open-Graded Surface	Structured Overlay	Structural Recycling Reconstruction <sup>3</sup>
Alligator Cracking			○						
Reflection Cracks	○								
Shrinkage Cracks	○								
Rutting			○		●	○	○		
Corrugations			○		●		○		
Depressions		⑤	○	○	●	○			
Upheaval	○						○		
Potholes	○							●	○
Raveling	○							●	○
Flushing					●	⑧	○	●	○
Polished Aggregate					●	⑦	○	●	○
Edge Joint Cracks			○	○	●		⑥	○	●
Slippage Cracks	○		⑤	⑤			⑥	○	●
Loss of Cover Aggregate	④		⑤	⑤			○	●	○

### Notes:

<sup>1</sup> Refer to Asphalt in Pavement Maintenance (MS-16), The Asphalt Institute, for details.

<sup>2</sup> When cracking exceeds 40 percent of the surface area of the pavement.

<sup>3</sup> If problem is extensive enough.

<sup>4</sup> Deep patch-permanent repair.

<sup>5</sup> Temporary repair.

<sup>6</sup> When accompanied by surface recycling.

<sup>7</sup> When rutting is minor.

<sup>8</sup> Over planed surface.

## How Much Can One Save With Recycling?

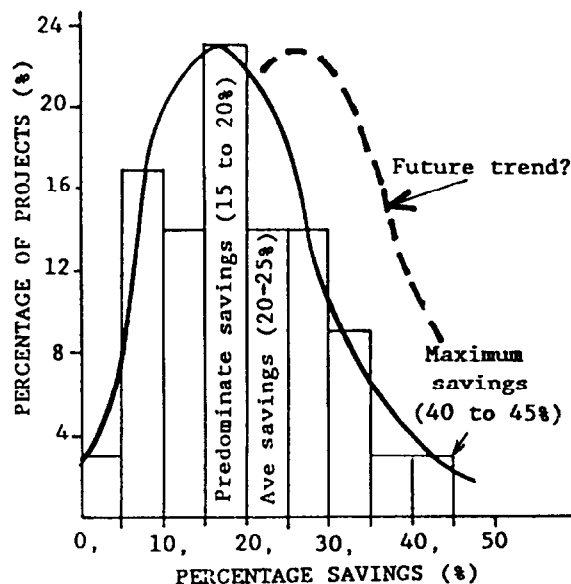
A previous report by FHWA defined the various (1980) cost savings by using hot-mix recycling of asphalt pavements in lieu of using virgin mixes.<sup>(b)</sup> Statistical analysis of the report's information revealed that:

- Average savings were 20 to 25 percent.
- Most projects saved 15 to 20 percent.
- Minimum savings were 0 to 5 percent.
- Maximum savings were 40 to 45 percent.

A plot of this information is shown in Figure A. As more experience occurs with recycling and as more recycling occurs, one can expect the curve to shift towards the right. Hence, more projects may have more savings.

**Figure A — Estimated Cost Savings by Recycling**

**(1980 Data)**



## An Example of Cost Savings

Savings with cold-mix asphalt recycling can vary greatly depending on many factors. One consultant contractor doing cold-mix recycling in the Northwest provides the following example of potential cost savings.<sup>(c)</sup>

### Existing Conditions

Cracked pavement, rutted and patched, 4-inch gravel base, 2 inches of asphalt concrete pavement. An old pavement with increasing traffic loads.

### Design Option Considered

1. Cold process renovation and chip seal.
2. Prelevel and a 3-inch ACP overlay.

### Unit Costs

Chip seal \$8,500/mile, asphalt emulsion \$150/ton, ACP in place \$32/ton, and shoulder gravel \$15/ton.

### Alternative 1 — Costs Per Mile

Pulverizing (\$0.50/sy)	\$ 7,040
Grade preparation (\$0.20/sy)	2,816
Water (\$0.10/sy)	1,408
Mixing emulsion (\$0.35/sy)	4,928
Emulsion (\$1.25/sy)	17,600
Grading & Compaction (\$0.30/sy)	4,224
Fog seal (\$0.10/sy)	1,408
Chip seal (\$0.65/sy)	<u>9,152</u>
Estimate cost for 1 mile	\$48,576

## Alternative 2 — Costs Per Mile

AC prelevel (1-inch average) (\$1.82/sy)	\$ 25,625
3-inch ACP overlay (\$5.47/sy)	77,018
2-foot shoulder	<u>4,100</u>
Estimated costs for 1 mile	\$106,743

## Cost Savings Using Cold-Mix Recycling

Alternative 2	\$106,743/mile
Alternative 1	<u>48,576/mile</u>
Approximate savings	\$ 58,000/mile

## Selected References

- Pavement Recycling Guidelines for Local Government*, Reference Manual, FHWA, 1986.
- A Basic Asphalt Emulsion Manual*, The Asphalt Institute, (MS-19).
- Asphalt Cold-Mix Recycling*, The Asphalt Institute, (MS-21)
- Recycling Manual*, Chevron.
- Thickness Design—Asphalt Pavement for Highway and Streets*, Asphalt Institute, (MS-1).

(b)FHWA, "Measurement of the Effectiveness of the FHWA Technology Transfer Program: 1985 Survey of Technology Adoption, Use, and Benefits," September 1985.

(c)Courtesy of Len Montague, President M&M Road Recycle, Inc., Redmond, WA.

*The Technology Transfer (T<sup>2</sup>) Program is a nationwide effort financed jointly by the Federal Highway Administration (FHWA) and individual state departments of transportation. Its purpose is to translate into understandable terms the latest state-of-the-art technologies in the areas of roads, bridges, and public transportation to local highway and transportation personnel.*

*Any opinions, findings, conclusions, or recommendations presented in this newsletter are those of the authors and do not necessarily reflect the views of WSDOT or FHWA. All references to proprietary items in this publication are not endorsements of any company or product.*

Published by



**Washington State  
Department of Transportation**  
Local Programs Division  
Northwest Technology Transfer Center  
Transportation Building  
P.O. Box 47390  
Olympia, WA 98504-7390

In cooperation with



**U. S. Department of Transportation  
Federal Highway Administration**

# Working With Difficult People

Chances are there are a few people at your job who are just plain difficult. And they are not about to change. Short of becoming a hermit in a cave, you just can't avoid difficult people, but you can learn ways of coping with them. Let's look at seven behavior types frequently found in difficult people and some ways to work with them.

**Bullies** try to get their way by being hostile and threatening. Avoid getting in a conflict with these people. Instead, just make your point firmly, using phrases like "I believe" or "I feel."

**Whiners** like to complain about things; they are happiest when they have a gripe, and they rarely have a solution to their problems. Let these people know you've heard their concern, then ask them directly, "What is it you want." When asked to come to grips with their complaints, they will back off.

**Silent types** love to cut you off without a word; you seldom get more than a "yes" or "no" out of them. These people are often deeply angry about something that may not even concern you. Try asking them questions that can't be answered with a simple yes or no. If you get no response, simply let them know your plans; then carry them out.

**Can't-do types** respond to any idea with "That won't work." Avoid arguing with these people. Ask them to suggest what will work. Support their positive ideas with lots of attention.

**Know-it-alls** will seldom hear you out because they always know more than you do. Don't let these condescending people get under your skin. Have all the facts before you meet, raise possible problems, and be ready to follow through.

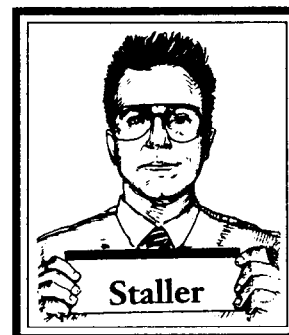
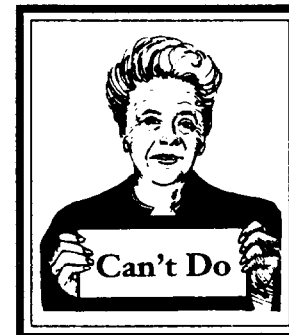
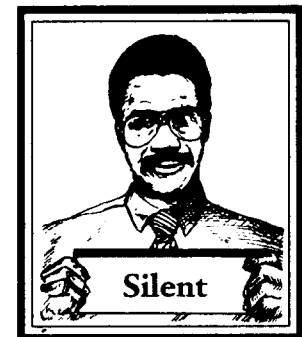
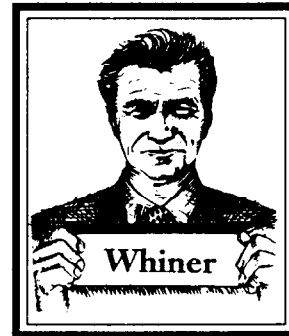
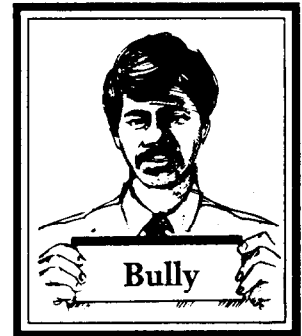
**Stallers** put off things until someone else takes over; they will seldom make a decision or carry out an action on their own. These people need a boost in self-confidence; show them that you value their judgment by asking them for help.

**Very nice people** can be the most frustrating of all to work with. They will agree with you, then do what they want to do. It's hard to know where you stand with them because they are afraid of not being liked if they disagree openly. You must constantly reassure these people that you like them even when you disagree with them. You may have to do a little digging to find out what they're really thinking.

## Don't Take It Personally

If you find yourself getting angry or defensive around difficult people, try not to give in to it. Don't take their actions and words personally. Their personalities existed before you came along, and will probably continue to cause them problems for the rest of their lives. Simply try to understand their behavior and work around it as best you can. You'll get more done and be less frustrated if you do.

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# New Bicycle/Pedestrian Manager Available for Questions

By Mike Dornfeld

Bicycling is a popular activity in Washington for transportation and recreation. Bicycle use is growing and expected to continue to grow. This increased interest in bicycling and recent federal, state, and local legislation have created new opportunities and demands for bicycle projects and programs.

To take advantage of these new opportunities, the Washington State Department of Transportation (WSDOT) has created a Bicycle and Pedestrian Program and hired a manager for the program. The Bicycle and Pedestrian Program Manager is Mike Dornfeld. Before coming to work for WSDOT, he worked in bicycle programs in the Seattle Engineering Department and the Washington, D.C. Department of Public Works.

In addition to the Bicycle and Pedestrian Program Manager, WSDOT also has bicycle coordinators in each district office, and a Citizen Bicycling Advisory Committee.

"One of my most important tasks is to work with local city and county staff who are trying to develop a bicycle plan, build a bicycle and pedestrian trail, or accommodate bicyclists on the local road network," said Dornfeld. "My office can be a source of information on all types of bicycle or pedestrian related issues."

A number of bicycle and pedestrian training sessions are being developed. A session on funding bicycle projects with money from the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) was held last fall in Shoreline. The training session was well received by the approximately 100 people attending. Future sessions, now being developed and planned, will focus on bicycle facility design. It is expected that this course will be held in a number of locations around the state this spring and fall.

Receiving attention also is the development of local nonmotorized plans. Not only does ISTEA require local agencies to develop bicycle and pedestrian plans as part of their transportation plan, but also requires projects to be on local plans before they can be funded. The WSDOT bicycle pedestrian program is working with a group of planners to provide information on how to develop a plan and what it should contain. This local planning action kit should be available later this spring.

If you have bicycle or pedestrian questions, contact Mike Dornfeld at WSDOT Bicycle Program, P.O. Box 47329, Olympia, WA 98504-7329, telephone (206) 705-7258.

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## Transportation and Engineering Associations

Anyone in this business called transportation must, at times, contact the national headquarters of various associations whether for ordering material or general correspondence. The list below highlights the more common ones.

- ☐ **American Association of State Highway and Transportation Officials (AASHTO)**, 444 North Capitol Street NW, Suite 225, Washington, DC 20001, (202) 624-5800.
- ☐ **American Public Transit Association (APTA)**, 1201 New York Avenue NW, Washington, DC 20005, (202) 898-4000.
- ☐ **American Public Works Association (APWA)**, 1313 East 60th Street, Chicago, IL 60637-2881, (312) 667-2200.
- ☐ **American Road and Transportation Builders Association (ARTBA)**, 501 School Street SW, Washington, DC 20024, (202) 488-2722.
- ☐ **American Society of Civil Engineers (ASCE)**, 345 East 47th Street, New York, NY 10017-2398; 1-800-548-ASCE.
- ☐ **American Traffic Safety Services Association (ATSSA)**, 5440 Jefferson Davis Highway, Fredericksburg, VA 22401, (703) 898-5400.
- ☐ **Bicycle Federation of American (BFA)**, 1818 R Street NW, Washington, DC 20009, (202) 332-6986.
- ☐ **Eno Foundation for Transportation, Inc.**, 8150 Leesburg Pike, Vienna, VA 22182, (703) 883-8243.
- ☐ **Highway Users Federation (HUF)**, 1776 Massachusetts Avenue NW, Washington, DC 20036, (202) 857-1200.
- ☐ **Institute of Transportation Engineers (ITE)**, 525 School Street SW, Suite 410, Washington, DC 20024-2729, (202) 554-8050.
- ☐ **International Road Federation (IRF)**, 525 School Street SW, Washington, DC 20024, (202) 554-2106.
- ☐ **National Association of Counties (NACO)**, 440 First Street NW, Washington, DC 20001, (202) 393-6226.
- ☐ **National Committee on Uniform Traffic Control Devices (MUTCD)**, 1776 Massachusetts Avenue NW, Suite 500, Washington, DC 20036-1993, (202) 857-1224.
- ☐ **National League of Cities**, 1301 Pennsylvania Avenue NW, Washington, DC 20004, (202) 626-3000.
- ☐ **Transportation Research Board (TRB)**, 2101 Constitution Avenue NW, Washington, DC 20418, (202) 334-2934.

# Selected References

*The following can be obtained directly from the sources listed.*

## U.S. EPA's Help! EPA Resources for Small Governments

This guide lists financial, technical, and educational assistance available to small communities. The 98-page report is available for \$3. To order, send payment to Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954.

## Transportation Planning Handbook

The Transportation Planning Handbook, a companion publication to ITE's Traffic Engineering Handbook, is a handy standalone reference for the transportation professional involved in the broader issues of traffic engineering and transportation planning. ITE, 1992. 525 pages, case bound. Publishing number TB-011; \$70.

## Construction Glossary

This new edition is "An Encyclopedia Reference and Manual," by J. Stewart Stein, AIA, FCSI. "Covers all you need to know about construction terminology — definitions, explanations, and interpretations. And it's based on the CSI MASTERFORMAT — including all 16 Divisions — so it's easy to use! Defines more than 30,000 terms — including past and current accepted usage. Offers detailed definitions of historical references, specification language, building and zoning code interpretations, reference standards, manufacturers' descriptions, and scientific and engineering analysis of materials. Also gives details about construction scheduling, reflective glass, computer rooms and access floors, alarm and warning systems, and more! New alphabetized index speeds information retrieval. 1,160 pp. (1993)." Available for \$95 from John Wiley and Sons, Inc., Department 063, P.O. Box 6793, Somerset, NJ 08875-9977.

## Bridge Inspection and Rehabilitation, A Practical Guide

Written by Parsons Brinckerhoff and edited by Louis G. Silano, P.E. "This book describes current practices in bridge inspection and rehabilitation. Included is information about all elements of a bridge structure, as well as materials and design types. The book also provides criteria for identifying bridge structures which are candidates for seismic retrofit, and presents guidance on safely maintaining traffic during bridge inspection and rehabilitation. In addition, it covers appropriate environmental control technologies related to bridge rehabilitation. 312 pp. (1992)." Available for \$75 from John Wiley and Sons, Inc., Department 063, P.O. Box 6793, Somerset, NJ 08875-9977.

## Transportation and Land Development

"An invaluable source of information that will prove useful in designing traffic access, circulation, and parking systems for new or redesigned developments. Covers transportation and urban development, site planning, traffic analysis, functional circulation systems, intersection design, access and site circulation design, parking and service facilities, and drive-in facilities." By V. G. Stover and F. Koepke. ITE/Prentice-Hall, 1987. 239 pages, casebound. Publishing No. TB-007; \$56 plus \$5 handling charge. Available through ITE, 525 School Street SW, Suite 410, Washington, DC 20024-2797. To order by phone contact ITE Bookstore at (202) 554-8050.

## APWA's Public Works Guide to Automated Mapping and Facilities Management (AM/FM)

This new book is "the guide for public works officials planning to use an Automated Mapping and Facilities Management System. It covers all the key areas:

1. Information on the latest hardware and software available for automated mapping and facilities management.
2. Current costs, questionnaires, and worksheets which lead readers step-by-step through the process of deciding what system to purchase and how to implement it.
3. A comprehensive glossary of terms which helps managers understand the AM/FM/GIS jargon in their own terms."

Available for \$60 for members. Contact APWA, 1313 East 60th Street, Chicago, IL 60637-2881.

## Need to know more?

**Contact WSDOT's Library  
(a free T<sup>2</sup> resource)**

(206) 705-7750  
SCAN 705-7750



# Educational Opportunities

*The purpose of this column is to inform you of the numerous educational opportunities that exist for our Washington State and adjacent states' transportation people. We also place this information on our electronic bulletin board. To obtain a brochure of details on the workshops listed, please contact the Northwest T<sup>2</sup> Center at (206) 753-0405.*

## **Northwest Technology Transfer Center----- (206) 753-0405**

The T<sup>2</sup> Center offers or supports numerous workshops of interest to public works agencies in Washington. Announcements are advertised in the newsletter, the *Bulletin*, and flyers are sent out to public works agencies requesting their interest prior to the workshops.

- ☐ **T<sup>2</sup> Centers "Road Shows."** March 15, 1993. Contact George McHaney at (206) 705-7385.
- ☐ **T<sup>2</sup> Road Raters Classes.** April 6-7, 8-9, Tumwater; April 19-20 and April 21-22 in Moses Lake.

## **County Road Administration Board (CRAB)**

If there is a special class you would like to see developed for counties, contact CRAB at (206) 753-5989.

## **Washington State University----- (206) 840-4575**

- ☐ **Innovative Compensation and Reward Programs for Team-Based Performance.** April 21-22, 1993, Seattle Airport Hilton. Cost \$895.

## **ASCE----- 1-800-548-2723**

- ☐ **NPDES Storm Water Permit Compliance.** April 29-30, 1993, Portland, or May 3-4, 1993, Seattle. Cost \$645 for members, \$745 for nonmembers.
- ☐ **Selecting Earth Retaining Structures.** April 20, 1993, Seattle. Cost \$345 for members, \$395 for nonmembers.
- ☐ **Practical Highway Drainage for Water Quantity and Quality.** June 7-9, 1993, Portland, or June 17-19, 1993, Seattle. Cost \$745 for members, \$855 for nonmembers.

## **Professional Engineering Practice Liaison Program (PEPL), University of Washington,**

## **College of Engineering ----- (206) 543-5539**

(All classes are at the University of Washington unless otherwise noted.)

- ☐ **Use of Constructed Wetlands for Stormwater Quality Enhancement.** April 21, 1993. Cost \$185.
- ☐ **Lake Processes and Control Techniques for Quality Enhancement.** June 8, 1993.
- ☐ **Construction Erosion and Sediment Control Inspector Training Program.** October 20, 21, 27, 28, 1993.
- ☐ **Bioremediation Technology for Hazardous Wastes.** October 25-26, 1993.
- ☐ **Biofiltration for Stormwater Runoff Enhancement.** November 17, 1993.
- ☐ **NPDES Permit Issues Workshop.** December 8, 1993.

## **Fred Pryor Seminars ----- 1-800-255-6139**

- ☐ **Assertiveness Skills for Managers and Supervisors.** April 22, 1993, La Quinta Hotel, Tacoma; April 23, 1993, Seattle Marriott Sea-Tac Airport, Seattle. Cost \$125.
- ☐ **Project Management.** April 27, Everett; April 28, Olympia; April 29, Seattle; April 26, Spokane; April 15, Tacoma. \$195.
- ☐ **Grammar, Usage, and Proofreading Skills.** May 3, 1993, Cavanaugh's River Inn, Spokane; May 4, 1993, West Coast Everett Pacific, Everett; May 5, 1993, Best Western Aladdin Motor Inn, Olympia; May 6, 1993, University Plaza Hotel, Seattle; May 13, 1993, La Quinta Hotel, Tacoma. Cost \$99.

## **National Seminars Group ----- 1-800-258-7246**

- ☐ **How to Handle Conflict and Manage Anger.** May 3, 1993, Quality Inn — Conference Center, Everett; May 4, 1993, Red Lion Inn, Pasco; May 5, 1993, Red Lion Inn, Yakima; May 6, 1993, Quality Inn Westwater, Olympia; May 25, 1993, Stouffer Madison Hotel, Seattle; May 26, 1993, Sheraton Hotel, Tacoma; June 7, 1993, Quality Inn Paradise Creek, Pullman; June 8, 1993, Red Lion Inn, Spokane; June 9, 1993, Best Western Lakeway Inn, Bellingham; June 10, 1993, Bellevue Inn, Bellevue; June 11, 1993, Red Lion Hotel, Kelso. Cost \$98.

## **American Road and Transportation**

## **Builder's Association (ARTBA) ----- (202) 488-2722**

- ☐ **Total Quality Management and Partnering.** May 4-5, 1993, Red Lion Hotel, Seattle. Cost \$475 members, \$595 nonmembers.

## **Battelle----- 1-800-426-6762**

Registrations for workshops are taken on first come, first served basis. Call Battelle for additional information.

- ☐ **The Effective Manager.** July 26-28, 1993, Seattle. Cost \$895.
- ☐ **The Manager as Leader.** July 12-14, 1993, Seattle. Cost \$985.
- ☐ **The Engineer as Manager.** April 28-29, 1993, Seattle. Cost \$885.
- ☐ **Managing Software Products.** June 3-4, 1993, Seattle. Cost \$885.

# Conferences and Meetings

- ❑ April 27-29, 1993. Washington Association of County Road Supervisors, Westcoast Wenatchee Center. Contact Ed Rich, Douglas County or Will Kinne (206) 591-7702.
- ❑ May 5-7, 1993. APWA, WA-OR Chapters Joint Spring Conference, Portland, OR.
- ❑ May 5-7, 1993. WSACE Professional Development Conference Red Lion Inn, Yakima.
- ❑ May 17-19, 1993. The 1993 Annual WSDOT/RTPO/MPO Conference, Ridpath Hotel, Spokane. Contact Mike Partridge, WSDOT, (206) 705-7964.
- ❑ May 20-21, 1993. Older Driver/Pedestrian Conference. Phoenix, Arizona. Cost \$95. Contact Patricia Herington (602) 266-6521.
- ❑ June 8-10, 1993. Washington State Association of Counties Annual Meeting. Town Plaza, Yakima.
- ❑ June 13-16. Annual Area IV HEEP Conference. Quality Inn Westwater, Olympia. Contact Daniel Dickson at CRAB (206) 753-5989 or Jim Michal at WSDOT (206) 705-7116.
- ❑ June 22-25, 1993. Association of Washington Cities Annual Meeting. Cavanaugh's, Yakima.
- ❑ June 25-29. Sixth International Conference on Low-Volume Roads. University of Minnesota. Contact TRB, National Research Council, 2101 Constitution Avenue NW, Washington, DC 20418.
- ❑ July 20-23, 1993. Environmental Analysis in Transportation. TRB Committee AIF02. Hosted by WSDOT, Western Hotel, Seattle. Contact Joanie Pop at (206) 705-7924.
- ❑ July 25-28, 1993. Pacific Rim Transtech Conference, Seattle, Washington. For more information, contact James R. Buss, WSDOT, (206) 705-7801.
- ❑ July 29-30, 1993. T<sup>2</sup> Regional Meeting, Seattle.
- ❑ August 10-13, 1993. International Conference on Transportation Facilities Through Difficult Terrain. Aspen, CO. Contact Catherine Catt (303) 248-7237.
- ❑ September 18-23, 1993. APWA International Public Works Congress and Exposition. Phoenix, AZ.
- ❑ October 12-15, 1993. APWA Fall Conference. Cavanaugh's, Yakima.
- ❑ November 17-19, 1993. WSAC Legislative Conference, Red Lion at the Quay, Vancouver.

## NW T<sup>2</sup> Advisory Committee

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# The BULLETIN

Spring/1993

*The Technology Transfer (T<sup>2</sup>) Program is a nationwide effort financed jointly by the Federal Highway Administration (FHWA) and individual state departments of transportation. Its purpose is to translate into understandable terms the latest state-of-the-art technologies in the areas of roads, bridges, and public transportation to local highway and transportation personnel.*

*Any opinions, findings, conclusions, or recommendations presented in this newsletter are those of the authors and do not necessarily reflect the views of WSDOT or FHWA. All references to proprietary items in this publication are not endorsements of any company or product.*

Published by



**Washington State  
Department of Transportation**  
Local Programs Division  
Northwest Technology Transfer Center  
Transportation Building  
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